

41.1 General Discussion

This chapter covers the design phase of projects on non-NHS routes, Federal Highway Administration (FHWA) funded projects, and discusses a delegation of authority by the FHWA to the Washington State Department of Transportation (WSDOT) Highways and Local Programs Service Center in administration of FHWA funds.

This part of the manual is organized into six chapters relating to the design phase of FHWA projects — General; Design Standards; Location and Design Approval; Plans, Specifications, and Estimates; State Advertising and Award Procedures; and Local Advertising and Award Procedures.

The approving agency identified for the various phases of work is illustrated in the following matrix.

Action	LA non-NHS CA	LA non-NHS non-CA Agency
a. PE Fund Auth. and Modif./Supp.	F	F
b. Exceptions to Design Stan.	S	S
c. Design App. (inc. prelim. and adv. detail br. plan app.	L	S
d. Experimental Work Plans	F	F
e. PS&E Approval	L	S
f. State furnished mat., cost-effective etermination	L	S
g. Proprietary item (public interest finding) sole source	L	S
h. Concurrence in Award	L	S
i. Buy America Exemption	F	F
j. Tied Bids	L	S
k. State Forces Work	L	S
F = FHWA		
S = WSDOT-Highways and Local Programs		
L = Local Agency		

Different standards apply to the design of new construction/reconstruction, 3-R (resurfacing, restoration, and rehabilitation), 2-R (resurfacing and restoration) and low volume streets and roads projects. Each of these terms is defined in Section 41.3. Local agencies must determine which standards apply before beginning design. Design Standards for Non-NHS routes are described in Chapter 42.

FHWA funds are also available for bridges on routes other than the FHWA system. Different standards are applicable to new or reconstructed bridges on these “off-system” roads. These standards are described in Chapter 42.

It is strongly encouraged that value engineering be used, as needed, throughout project development, construction, operation, and maintenance. Value engineering analysis should be performed on projects where its employment has a high potential for public benefit.

Value engineering should be considered on high cost and major projects. The need for value engineering should be determined on a project-by-project basis (see Chapter 43).

Design and construction standards for enhancement projects are outlined and defined in Chapter 62.

41.2 New Construction/ Reconstruction Projects (refer to Chapter 42 for standards)

.21 A reconstruction project is designed to meet the minimum design standards for new construction for the functional class. Reconstruction includes significant changes in cross-section or shifts in both vertical and horizontal alignment. If 50 percent or more of the project length involves vertical or horizontal alignment changes, the project will be considered reconstruction. Reconstruction may require acquisition of additional right-of-way, and may include all items of work usually associated with new construction, including items a. through n. below.

- a. Pavement Type Determination. The determination of pavement type is of major importance in the development of plans for any urban street and road paving improvement. The main factors to be considered in determination of pavement type are outlined in Section 520 of the WSDOT *Design Manual*.

The local agency should have on file documentation of factors considered in determining that the pavement to be used has been carefully selected in terms of engineering, economics, and current design standards. The pavement analysis should identify the design life, lifecycle costs, and impacts of the various alternatives on the total project.

The design live loading for urban streets and roads shall not be less than the current state of Washington maximum legal load, unless other analysis recommends less.

The WSDOT Materials Laboratory will provide design guidance if requested by the local agency through the Regional Highways and Local Programs Engineer.

- b. Structural Design. Design procedures shall conform to accepted engineering practices approved by a registered professional engineer. Bridge deck protection is required for all FHWA funded bridge construction. The recommended protective systems are outlined in the WSDOT *Bridge Design Manual*.

- c. Roadway Geometrics. Design(s) shall be based upon accepted engineering practices and the requirements listed in this manual.
- d. Construction Specifications. All FHWA projects, including local agency force projects, shall be constructed in conformance with the current edition of the WSDOT/ APWA *Standard Specifications for Road, Bridge, and Municipal Construction* (as outlined in Section 44.4).
- e. Traffic Control. All traffic control devices shall conform to the MUTCD, as adopted and modified by the Secretary of Transportation, per RCW 47.36.030.
- f. Clear Zone. The clear zone is the roadside border area starting at the edge of the traveled lane that is available for safe use by errant vehicles.

The clear zone distance tables in the WSDOT *Design Manual* and Appendix 42.31 provide criteria for establishing clear zone distances.

- g. Geometric Cross-Section. It is desirable that all new construction provide embankment slopes and ditch in-slopes of 4:1 or flatter. Embankment slopes of 3:1 or steeper may be used when achieving flatter slopes has demonstrated to be impractical.
- h. Vertical Clearance. Vertical clearance above the paved roadway surface shall be a minimum of 5 meters (16.5 feet). Vertical clearance of structures above the walkway surface shall be a minimum of 2.44 m (8 feet).
- i. Bridge Approach Railings. Approach guardrail is required at all bridge ends and shall be made structurally continuous with the bridge railing.

A guardrail layout has been developed for use when an intersecting roadway or private approach exists within the limit of the standard bridge approach guardrail. See Standard Plan C-2f in the WSDOT/ APWA *Standard Plans for Road, Bridge, and Municipal Construction*. This standard plan should be used only when it is not feasible to relocate the intersecting roadway or private approach.
- j. Bridge Railings. Only bridge rail designs that have been successfully crash tested (or their equivalents) shall be used on federally funded new construction or reconstruction projects. The WSDOT *Bridge Design Manual* (M 23-50) contains guidelines and performance levels for bridge railing along with examples of bridge rail designs that have been crash tested. (Refer to Section 8.3 of the *Bridge Design Manual*.)
- k. Illumination.
 - 1. Consider roadway illumination for high activity pedestrian areas (bus stops, crosswalks, etc.).
 - 2. Consider low energy consumption designs.

- l. Pedestrian Facilities. In urban areas, sidewalks are desirable on both sides of the street. Clear sidewalk width shall be at least 1.22 m (4 feet).
- m. Bicycle Facilities. Streets and roads intended to accommodate designated bicycle routes shall meet or exceed the standards of WSDOT per RCW 35.75.060. WSDOT *Design Manual* (M 22-01) chapter on bicycle facilities should be used as a design guideline.
- n. Sidewalk Ramps. Ramps shall be included in all walkways and/or curb construction per RCW 35.68.075. The ramps shall meet the minimum design requirements of the Americans with Disabilities Act. These standards are outlined in the June 30, 1994 Federal Register.
- o. Drainage and Hydraulic Design. Refer to WSDOT *Hydraulics Manual* and Local Agency Requirements.

41.3 3-R Projects (Resurfacing, Restoration, and Rehabilitation) (refer to Chapter 42 for standards)

.31 Safety Improvements. A safety improvement evaluation (see Appendix 41.71 for guidance) must be an integral part of all projects and could include:

- Upgrading existing substandard roadway design elements — roadway design elements are the physical characteristics of the highway, such as alignment, grades, widths, sight distance, clearances, bridges, and the pavement structure including surface texture.
- Improving existing operational features — operational features include traffic control devices, lighting, and pedestrian accommodations that provide for the safe and efficient movement of vehicles and pedestrians.
- Reducing the potential hazard of existing roadside features — roadside features include sideslopes, ditches, drainage facilities, barrier systems, sign supports, luminaires, trees, utility poles, and other features adjacent to the roadway.
- Upgrading bridge safety features — on all projects which include structures with deficient safety features, consideration must be given to correcting the deficient features. Bridge rails, approach rails, connections, and terminals are considered bridge safety features.

.32 Superelevation. In order to provide the same degree of safety and comfort on 3-R projects as on any other project, superelevation, including transitions, should be provided.

Rebuilding horizontal curves to larger radii and appropriate superelevation should always be considered, especially when accident data indicate that a problem exists.

Urban arterial streets and roads should be superelevated the same as rural roadways, within the constraints imposed by adjacent development, curbs, sidewalks, weather, and other conditions.

- .33 Pavement.** Pavement design should use the minimum depth practical to achieve a structural section capable of carrying projected loads over the design period. A pavement design should also use a surface that provides and retains adequate skid resistance. Refer to Appendix 42.31 for design information.
- .34 Geometric Cross-Section.** Foreslopes (fill slopes and ditch inslopes) and cut slopes may be affected as a result of proposed work on the roadway and shoulder surfaces. Refer to Appendix 42.31 for standards.
- .35 Alignment.** Alignment improvements should be undertaken in cases where the number of accidents has been high and where previously installed warning signs, markings, or other devices have not proven effective.
- .36 Curvature.** If the calculated design speed for a particular horizontal or vertical curve is less than 15 mph (24 km/h) below the designated speed limit of the adjacent sections, and the location is not an identified high accident location, proper signs and markings informing drivers of the condition may be used in lieu of reconstruction to meet standards for the assumed design speed. When the difference is 15 mph (24 km/h) or more, or when the design speed of the horizontal or vertical curve is less than 20 mph (32 km/h), corrective action should be undertaken. If improvement is not practicable, additional signs and markings and other provisions must be used to provide for proper speed transition.

Sight distance on horizontal curves and at intersections can often be improved by minor cut slope flattening or selective clearing or both.
- .37 Grades.** Grades generally do not need to be flattened on 3-R projects. Steep grades and restricted horizontal or vertical curvature in combination, however, may warrant investigation.
- .38 Clear Zone.** For safety, it is desirable to provide a roadside recovery area that is as wide as practical. But since 3-R projects are constrained by topographic features and right-of-way, considerable judgment must be used. The clear zone must be given particular attention at identified high roadside accident locations (fixed object accidents). An adequate clear zone at some horizontal curves, especially those at the end of a downgrade, should be provided if practicable. See the following chapter (Chapter 42) for applicable standards.

41.4 2-R Projects (Resurfacing and Restoration)

Refer to Section 41.3 and the following chapter (Chapter 42) for standards.

41.5 Low Volume Roads and Streets

Refer to Chapter 42 for standards. These roads and streets have volumes less than 400 ADT and have separately developed standards.

41.6 Deviations

- .61 General.** Requests for deviations from the standards in Chapter 42 will be submitted to the Region Local Programs Engineer and will be transmitted to the Assistant Secretary for Highways and Local Programs for approval or denial.

The CA Agency is authorized to design projects to the standards provided in Chapter 42, following the warrants and qualifying statements given. In the event all minimum recommendations cannot be incorporated into the design, the agency shall submit the deviation request for review and approval by Highways and Local Programs.

- .62 Documentation.** A local agency shall document their reasons for deviation from these standards. The deviation request shall include a description of the problem and its proposed solution and a vicinity map in sufficient detail to aid in evaluating the problem. The deviation request document should generally stand complete on its own, without references to other sources or documents. Appropriate quotes and excerpts should be used if necessary.

An analysis of the engineering and financial aspects of the proposal as compared to the standard and options considered shall be provided. The analysis shall specifically address safety issues, including accident history and projections. It shall address applicable operational characteristics, including traffic speeds, traffic volumes, capacity and route continuity. It should include financial considerations such as high construction costs, unusual or extraordinary site conditions, or environmental requirements that may impact the decision. The analysis may include a Benefit/Cost comparison, and/or Life Cycle Costing of alternatives considered. The analysis should also include any other information which may be helpful as a future reference.

The level of detail of the request should be based on the relative complexity and scope of the project and the deviation requested. Requests will be considered based on the merits presented. This analysis and deviation request shall be documented and completed prior to the agency's completion of PS&E documents.

.63 Format. Appendix 41.72 is a Sample Deviation Analysis Format sheet. The sample is intended to present format only.

41.7 Appendixes

41.71 [Safety Checklist — A Guideline for 2-R and 3-R Projects](#)

41.72 [Sample Deviation Analysis Format](#)

Safety Checklist — A Guideline for 2-R and 3-R Projects

Appendix 41.71

Project _____	_____
Number	Title

Local Agency	

The proposed project should be given a roadside hazard inventory to determine if the following elements exist within the project termini and if the scope of the project includes construction, elimination, modification, or protection of these elements:

Drainage Structures

Existing: _____ Proposed: _____
Project includes mitering end sections: Yes: _____ No: _____
Comments:

Guardrail (Reviewed for Adequacy)

Comments:

Signs, Signals, and Illumination Supports

Existing: _____ Proposed: _____
Breakaway bases proposed: Yes: _____ No: _____
Comments:

Bridge Piers/Abutments

Protection Existing: _____ Protection Proposed: _____
Comments:

Clear Zone (Reviewed for Adequacy)

Roadside Obstacles:
Trees:
Utility Poles:
Ditch Cross-Sections:
Protection Proposed:

Comments:

Horizontal Alignment (Reviewed for Adequacy)

Comments:

Vertical Alignment (Reviewed for Adequacy)

Comments:

Roadway Widths (Reviewed for Adequacy)

Comments:

Sight Distance (Reviewed for Adequacy)

Comments:

Pavement Structure (Reviewed for Adequacy)

Comments:

Traffic Control Devices

Warranted: _____ Unwarranted: _____

Comments:

Side Slopes (Reviewed for Adequacy)

Comments:

3:P65:DP/LAG4

Agency: _____

Project Title: _____

Project No.: _____

1. Posted Speed Limit: _____

2. Physical Comparison:

(a) Standard Geometrics

(b) Deviation Geometrics

(c) Discussion

3. Cost Comparison:

	Standard Cost	Deviation Cost	Discussion
Roadway			
Structure			
Other			

4. Reasons Standard Cannot be Achieved at This Time:

5. Certification:

I have examined this deviation request and believe it to be in the best public interest that it be granted.

Date_____
Local Agency Engineer

